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Chemical Studies on the Ocean. (LIX)

Chemical Studies of the Shallow-water Deposits. (12)
On the Chemical Constituents of the Shallow-water Deposits along the Sea-coast of Okayama Prefecture[1]

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In this paper, the results of analysis, carried out laying emphasis on K, of eight kinds of deposits from the sea-coast of Okayama Prefecture are described, some of them being compared with those of muds from the sea-coasts of Korea, Aichi and Hiroshima Prefectures which were reported in the previous papers.

The K_2O content reported in this paper ranges 1.39~2.77% and its mean value amounts to 2.00%, which is similar to that of Korea and Aichi, but lower than that of Hiroshima.

INTRODUCTION

In the previous paper[2], we reported on the chemical composition of eleven kinds of the deposits from the sea-coasts of Aomori and Iwate Prefectures. In this paper, the analytical results of eight kinds of the muds from the sea-coast of Okayama Prefecture are described.

In this districts, as in Aichi[3] and Hiroshima[4], there are many places where the deposits immediately along the sea-coast consist of muds. Namely, it is shown in the Charts Nos. 106, 153 and 155** that mud banks dry at nearly lowest low water at Kinkai, Kojima and Kasaoka Bays, in the neighbourhood of the estuary of the Asahi River and in many other places.

SAMPLES

Locality and date of sampling are shown in Table 1.

All of these samples are the deposits collected in the neighbourhood of the shoreline.

Sample 50: dark grayish green fine mud containing shell fragments; collected by K. Mikami in the neighbourhood of Katakami Port.

Sample 82: grayish green sandy mud containing shell fragments; collected by I. Takahara at the point near the entrance to Awarigō Port.

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** Issued by the Japanese Hydrographic Office in 1936, 1932 and 1932, respectively.

Table 1.

Sample No.	Locality	Date
50	Okiura, Higashikatakami, Katakami-machi, Wake-gun, Okayama Prefecture	Apr. 24, 1949
82	Awarigō, Nagahama-mura, Oku-gun, Okayama Prefecture	Aug. 1, 1949
51	Nishitakasaki, Nadasaki-mura, Kojima-gun, Okayama Prefecture	Nov. —, 1948
52	〃 〃	〃 〃
53	Ōsaki, Hachihama-machi, Kojima-gun, Okayama Prefecture	Apr. 4, 1949
54	Hachihama-machi, Kojima-gun, Okayama Prefecture	Apr. 4, 1949
55	Yorishima-machi, Asaguchi-gun, Okayama Prefecture	Apr. 23, 1949
56	Yōsuna, Kanaura-machi, Oda-gun, Okayama Prefecture	Mar. 31, 1949

Samples 51 and 52*: grayish green fine muds; collected by Y. Miyake at the western end of the 7th reclaimed land at Kojima Bay.

Samples 53*: grayish green fine mud containing shell fragments; collected by K. Hashizume at the point about 2 km east of the estuary of the Kamo River before reclamation.

Sample 54*: grayish green mud containing shell fragments; collected by K. Hashizume at the point about 900 m southwest of the 7th sluice in the 7th reclaimed land.

Sample 55: grayish green mud containing small amounts of shell fragments; collected by R. Hirosawa at the point about 900 m west of Hōjinohana.

Sample 56: grayish green mud; collected by M. Okuno at the point about 150 m southeast of the estuary of the Yoshida River.

The geology of the land adjacent to the locations sampled is briefly as follows**:

Sample 50: rhyolite.

Sample 82: rhyolite and Quaternary formations; (Paleozoic formations and granites).

Samples 51, 52, 53 and 54: Quaternary formations; (Paleozoic formations and granites).

Sample 55: Quaternary formations and granites.

Sample 56: Quaternary formations and granites; (Paleozoic formations).

EXPERIMENTAL PROCEDURE, RESULTS AND DISCUSSION

* The reclamation works of the 7th reclaimed land at Kojima Bay, where Samples 51～54 were collected, were started in 1944 and going on at the time of sampling.

** The rocks and formations which distribute in the land areas not so far from the location of collection are put in parentheses.

Experiments were carried out as described previously[5].

The analytical results of the air-dried samples are shown in Table 2. From this table we obtained the percentages of chemical constituents in the sea-salt-free samples dried at 105~110°C as shown in Table 3*.

From Table 3, it is seen that Samples 51, 52 and 53 which are fine muds, collected at Kojima Bay, have considerably lower content of SiO_2 and higher contents of Fe_2O_3 and Al_2O_3 than the others.

As for the K_2O content, it is lower in Samples 50, 51, 52 and 54, and relatively higher in Samples 55 and 56.

Now, as we have completed the analysis of the muds collected from Aichi[3], Hiroshima[4] and Okayama Prefectures, that is, most of the districts in Japan Proper which have many places where the deposits near the shoreline consist of muds, we will discuss the chemical composition of the deposits in this report comparing with that of the muds of Aichi Prefecture (8 kinds), Hiroshima Prefecture (5 kinds) and Korea (20 kinds)[7].

The SiO_2 content shown in this report ranges 57.34~72.17 %, and the mean value amounts to 64.74 %, which is lower than that of Aichi, 69.02 %, and is almost the same as that of Hiroshima, 64.55 %, and that of Korea, 64.40 %.

The Fe_2O_3 content ranges 2.93~7.29 %, and its mean value amounts to 5.03 %, which is lower than that of Korea, 7.16 %, and is slightly higher than 4.16 % of

Table 2. Chemical composition of the deposits.

Sample No.	50	82	51	52	53	54	55	56
	%	%	%	%	%	%	%	%
Drying loss	3.81	3.18	7.07	7.17	5.69	2.98	1.32	5.29
Ignition loss	9.11	6.16	9.10	9.16	9.63	5.35	3.11	4.50
Fe_2O_3	4.45	2.80	6.12	6.52	5.95	4.89	2.96	3.51
TiO_2	0.65	0.30	0.81	0.81	0.61	0.58	0.56	0.50
Al_2O_3	12.93	12.29	17.46	17.12	14.69	12.54	13.52	13.16
MnO	0.05	0.09	0.29	0.25	0.07	0.09	0.09	0.08
CaO	2.41	4.20	1.55	1.81	2.86	3.47	2.39	1.27
MgO	1.23	1.29	2.25	2.07	1.48	1.35	3.04	0.76
K_2O	1.51	2.02	1.45	1.64	2.04	1.35	2.72	2.44
Na_2O	2.08	2.23	1.80	2.39	2.89	1.64	2.87	2.11
SiO_2	61.70	64.94	52.27	51.26	53.54	65.43	67.68	66.82
SO_3	1.70	0.73	0.56	0.69	1.33	0.37	0.34	0.45
Cl	1.21	0.62	1.30	1.90	2.64	0.52	0.56	1.17
P_2O_5	0.12	0.13	0.12	0.13	0.09	0.11	0.07	0.09
CO_2	1.32	2.06	—	—	1.31	1.80	0.24	—
N	0.17	0.11	0.17	0.15	0.09	0.10	0.08	0.05

* We performed this calculation on the basis of the same assumption as in the previous paper[5].

Table 3. Chemical composition of the deposits on sea-salt-free and dry basis (calculated from Table 2).

Sample No.	50	82	51	52	53	54	55	56
	%	%	%	%	%	%	%	%
Fe_2O_3	4.73	2.93	6.76	7.29	6.65	5.09	3.03	3.79
TiO_2	0.69	0.31	0.89	0.91	0.68	0.60	0.57	0.54
Al_2O_3	13.76	12.84	19.28	19.15	16.41	13.05	13.84	14.21
MnO	0.05	0.09	0.32	0.28	0.08	0.09	0.09	0.09
CaO	2.52	4.37	1.67	1.96	3.11	3.59	2.43	1.33
MgO	1.16	1.27	2.32	2.08	1.33	1.34	3.05	0.68
K_2O	1.57	2.10	1.57	1.78	2.21	1.39	2.77	2.60
Na_2O	1.26	1.85	0.92	1.10	1.04	1.30	2.51	1.34
SiO_2	65.64	67.86	57.71	57.34	59.80	68.10	69.29	72.17
SO_3	1.66	0.69	0.45	0.53	1.14	0.32	0.28	0.33
P_2O_5	0.13	0.14	0.13	0.15	0.10	0.11	0.07	0.10
CO_2	1.40	2.15	—	—	1.46	1.87	0.25	—
N	0.18	0.11	0.19	0.17	0.10	0.10	0.08	0.05
$Na_2O + K_2O$	2.83	3.95	2.49	2.88	3.25	2.69	5.28	3.94
K_2O/Na_2O	1.25	1.14	1.71	1.62	2.13	1.07	1.10	1.94

Aichi and 4.55 % of Hiroshima.

The Al_2O_3 content ranges 12.84~19.28 %, and its mean value amounts to 15.32 %, which is higher than that of Aichi, 12.96 %, and similar to 15.84 % of Hiroshima and 15.14 % of Korea.

As for the MnO and P_2O_5 contents, their average values amount to 0.14 % and 0.12 %, respectively, and the former is higher than that of other districts which is 0.06 % or less, and the latter is similar to that of others.

As for the CaO and MgO contents, the average CaO value amounts to 2.62 %, which is similar to that of Korea, 2.37 %, and higher than 1.86 % of Aichi and 1.93 % of Hiroshima. But if we recalculate CaO % based on the $CaCO_3$-free samples, assuming that shell fragments consist of $CaCO_3$ alone and CO_2 in the analyses results only from shell fragments, its average content in the muds reported in this paper amounts to 1.52 %, which is similar to that of Hiroshima, 1.39 %, and lower than 1.89 % of Korea, but higher than 0.99 % of Aichi. The average MgO content amounts to 1.65 %, which is similar to that of Korea, 1.56 %, and slightly higher than 1.33 % of Hiroshima and comparatively higher than 0.85 % of Aichi.

The N content ranges 0.05~0.19 % and the mean value amounts to 0.12 %, which is higher than that of Hiroshima, 0.08 %, and similar to 0.13 % of Aichi and 0.10 % of Korea.

As for alkalies, the K_2O content ranges 1.39~2.77 % and its mean value amounts to 2.00 %, which is similar to that of Aichi, 2.18 %, and that of Korea, 2.31 %,

but lower than 2.84 % of Hiroshima. The Na_2O content is considerably low in most of the deposits shown in this report, therefore, the $Na_2O + K_2O$ content is generally low, being less than 4 % in most of them, and its mean value amounts to 3.41 %, which is similar to that of Aichi, 3.27 %, but lower than 4.58 % of Korea and 5.77 % of Hiroshima.

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